

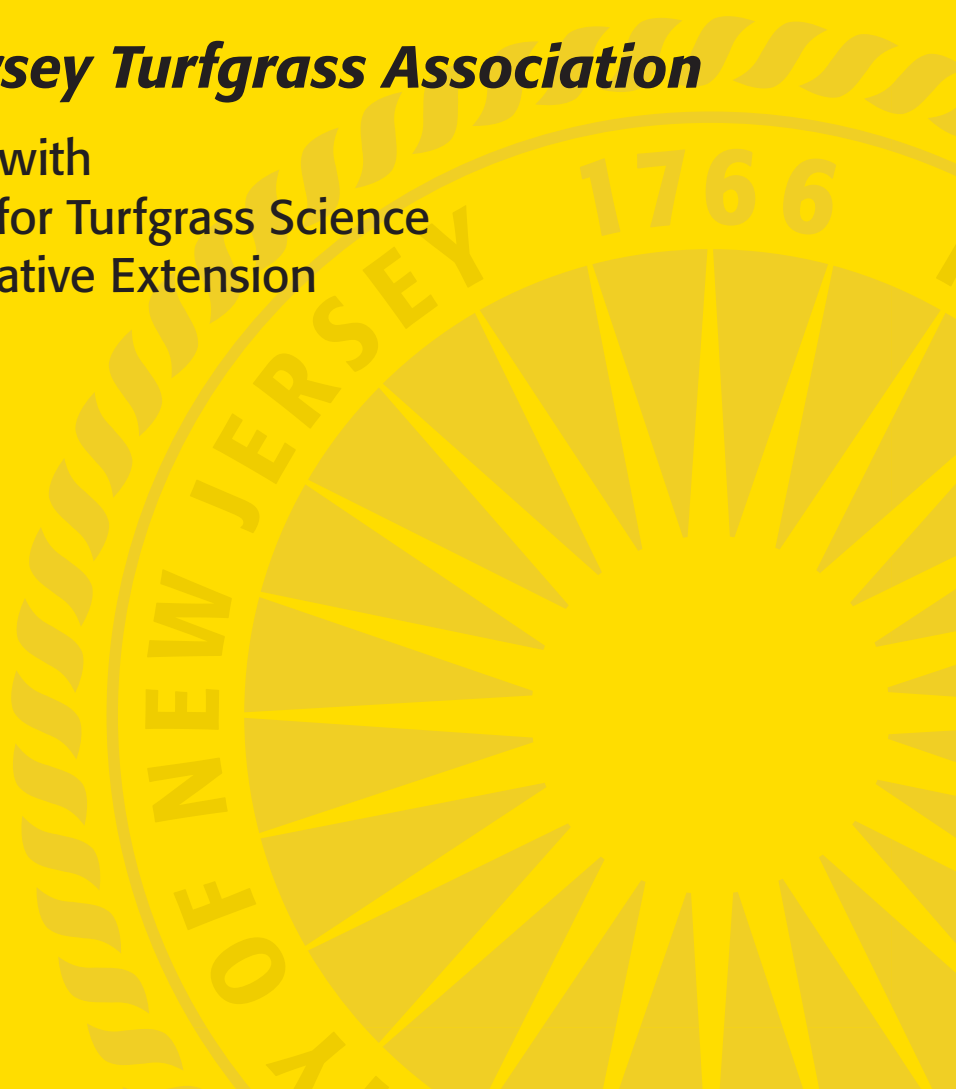
RUTGERS

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The New Jersey Turfgrass Association

In Cooperation with
Rutgers Center for Turfgrass Science
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The Rutgers Turfgrass Proceedings is published yearly by the Rutgers Center for Turfgrass Science, Rutgers Cooperative Extension, and the New Jersey Agricultural Experiment Station, School of Environmental and Biological Sciences, Rutgers, The State University of New Jersey in cooperation with the New Jersey Turfgrass Association. The purpose of this document is to provide a forum for the dissemination of information and the exchange of ideas and knowledge. The proceedings provide turfgrass managers, research scientists, extension specialists, and industry personnel with opportunities to communicate with co-workers. Through this forum, these professionals also reach a more general audience, which includes the public.

This publication includes lecture notes of papers presented at the 2006 New Jersey Turfgrass Expo. Publication of these lectures provides a readily avail-

able source of information covering a wide range of topics and includes technical and popular presentations of importance to the turfgrass industry.

This proceedings also includes research papers that contain original research findings and reviews of selected subjects in turfgrass science. These papers are presented primarily to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

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Dr. Ann Brooks Gould, Editor
Dr. Bruce B. Clarke, Coordinator

INFLUENCE OF FUNGICIDES AND BIORATIONAL PRODUCTS ON THE DEVELOPMENT OF ANTHRACNOSE BASAL ROT ON AN ANNUAL BLUEGRASS GREEN

Bruce B. Clarke, Pradip R. Majumdar, Annmarie Scholz, Mark Peacos, Amy Matlack, Lindsay Jepsen, Dennis Fitzgerald, Sam Camuso, John Inguagiato, and Tracy J. Lawson¹

Fungicides were evaluated in 2006 for their ability to control anthracnose basal rot (caused by *Colletotrichum cereale*) on an annual bluegrass (*Poa annua*) putting green at the Rutgers Turf Research Farm in North Brunswick, NJ. The green was established October 2004 on a Norton loam with a pH of 6.2 by killing the existing stand of *Agrostis* and *P. annua* with Roundup Pro 3LC (3 qt/A) and then core aerifying the site in two directions to bring dormant *P. annua* seed to the soil surface. Mowing was performed daily at a height of 0.125 inch with clippings collected. The site was irrigated as needed to prevent drought stress.

Fertilizer was applied as 34-0-0 (0.2 lb nitrogen (N)/1000 ft²) + 20-20-20 (0.1 lb N/1000 ft²) on 4 May, 20-20-20 (0.1 lb N/1000 ft²) on 7 May, 34-0-0 (0.2 lb N/1000 ft²) + 20-20-20 (0.24 lb/N 1000 ft²) on 13 May, 34-0-0 (0.2 lb N/1000 ft²) + 20-20-20 (0.2 lb/N 1000 ft²) on 21 May, 34-0-0 (0.1 lb N/1000 ft²) on 2 June, 34-0-0 (0.1 lb N/1000 ft²) on 7 June, 34-0-0 (0.15 lb N/1000 ft²) on 15 June, 34-0-0 (0.1 lb N/1000 ft²) + 20-20-20 (0.1 lb/N 1000 ft²) on 29 July, 21-0-0 (0.2 lb N/1000 ft²) on 10 August, 34-0-0 (0.2 lb N/1000 ft²) on 16 August, and 21-0-0 (0.1 lb N/1000 ft²) on 22 August. Dimension 0.15G (26.5 oz/A) was applied on 26 April for pre-emergence weed control and Fusilade 2L (0.21 fl oz/1000 ft²) was sprayed on 28 May to eliminate creeping bentgrass from the site.

Diseases other than anthracnose (e.g., dollar spot and brown patch) were suppressed in the test area with Curalan 50EG (1.0 oz/1000 ft²) on 5 May, Emerald 70WG (0.18 oz/1000 ft²) on 27 May, Curalan 50EG (1.1 oz/1000 ft²) on 8 June, Curalan 50EG (1.2

oz/1000 ft²) + ProStar 70W (2.7 oz/1000 ft²) on 27 June, and Emerald 70WG (0.18 oz/1000 ft²) + ProStar 70W (2.0 oz/1000 ft²) on 9 and 29 July. Previous research by the authors have shown that Curalan 50EG, ProStar 70W, and Emerald 70WG do not affect anthracnose development at the rates used in this study. The growth regulator Primo MAXX 1ME (0.125 fl oz/1000 ft²) was applied to the trial every 14 days from 22 May to 22 September, but seedhead suppressants were not used. Insect pests were controlled with Telstar GC 0.67F (0.5 oz/1000 ft²) on 2 May and Merit 75WSP (0.16 oz/1000 ft²) on 5 July. Turf was topdressed with a sand root zone mix on 25 April and 2 September. Plots were 3 x 5 ft and were arranged in a randomized complete block with four replications.

Fungicides were applied in water equivalent to 1.9 gal/1000 ft² with a CO₂ powered sprayer at 30 psi using Tee Jet 8003E nozzles. Treatments (trt) were initiated on 17 May, prior to the development of anthracnose. Fungicides were reapplied at the appropriate intervals until 22 August as indicated in Table 1. Turf was visually evaluated for percent turf area infested with anthracnose on 28 June, 8, 18, and 27 July, and 7 and 17 August. Turf quality was evaluated on 17 August using a 1 to 9 scale, where 9 = best turf quality and 6 = acceptable quality. Phytotoxicity was evaluated on 9 June using a 1 to 5 scale, where 1 = no foliar discoloration, 2 = slight chlorosis or necrosis, 3 = moderate chlorosis or necrosis, 4 = severe chlorosis or necrosis, and 5 = all turf dead. Data were subjected to analysis of variance and means were separated by Waller-Duncan *k*-ratio *t*-test (*k*=100).

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Anthracnose developed on 22 June as a natural infection and became uniformly distributed throughout the green by 28 June. Disease severity peaked on 17 August (89 to 98% turfgrass area infested on non-fungicide treated turf). Due to the extreme severity of this natural epidemic, only Daconil Ultrex 82.5WDG @ 3.25 oz every 14 days (trt 5), RU 2125-06F (trt 9), RU 2125-06F + RU 2125-06L (trt 10), Chipco Aliette Signature 80WG @ 4oz + Daconil Ultrex 82.5WDG 3.25 oz every 14 days (trt 12), RU192514A-06 + RU192514B-06 (trt 22), CL-EXP-9 (trt 67), Manicure Ultra 82.5WDG @ 3.25 oz every 7 days (trt 85), Manicure Ultra 82.5WDG @ 3.25 oz + Spectator Ultra 1.3EC @ 1.0 fl oz every 14 days (trt 89), Chipco Signature 80WG @ 4 oz + Daconil Ultrex 82.5WDG @ 3.5 oz every 14 days (trt 103), PEX-6012 80WDG + Pegasus 82.5WG (trt 104), and PEX-6013 80WDG + Pegasus 82.5WG (trt 105) provided adequate control of anthracnose (i.e., less than 10% turf area infested) throughout the application period (17 May to 16 August).

Only 10% of the treatments evaluated afforded adequate protection, and most of these entries contained chlorothalonil or tebuconazole (a DMI fungicide and a component of several of the experimental products tested). It is interesting to note that fungicides in the QoI, benzimidazole, dicarboximide, DMI (except for tebuconazole), antibiotic (e.g., Endorse), phenylpyrrole, and phosphonate fungicide groups did not protect turf during the severe anthracnose epidemic in 2006, even though they typically provided

acceptable levels of control in previous years on this site. Even under relatively moderate disease pressure (e.g., on 28 June and 8 July when untreated turf sustained 31 to 35% infection), the QoI and benzimidazoles in the current study did not provide adequate control unless tank mixed with another fungicide chemistry. Except for chlorothalonil, tank mixtures of different fungicide chemistries generally provided better disease control than single products.

RU 192514A-06 (an experimental systemic acquired resistance material) suppressed anthracnose during the first three evaluations when used alone (trts 17 to 19), compared to untreated turf (trts 106 and 107). Moreover, it enhanced the degree of control afforded by RU192514C-06 (a DMI fungicide) throughout the study when tank mixed at the highest (0.0172 oz/1000 ft²) rate (trt 27 compared to trt 21).

Slight to moderate foliar chlorosis was noted on 9 June for turf treated with RU2125-06E (trt 11), RU192514A-06 (trt 17), Insignia 20WG + Revolution L (trt 45), Insignia 20 WG + Cascade L (trt 46), CL-EXP-9 (trt 67), Rhapsody AS (trt 68), SARS-346 40WP (trt 78), and Spectator Ultra 1.3EC (trt 84). Phytotoxicity was not observed for any other treatment. Turf quality evaluated at the conclusion of the study was closely associated with anthracnose control. All products that provided acceptable disease control throughout the test exhibited acceptable (> 6.0) turfgrass quality on 17 August.

Table 1. Influence of selected fungicides and biorational products on the development of anthracnose on an annual bentgrass green: New Brunswick, NJ, 2006.

Treatment	Rate per 1000 sq ft)	Spray Interval (days) ⁴	Turf Area Infested (%) per Plot ¹					Phyto-toxicity ² 9 June	Turf Quality ³ 17 Aug.	
			28 June	8 July	18 July	27 July	7 Aug.			17 Aug.
1 EcoGuard L.....	20.0 fl oz	7	12.8 p-x	24.5 z-z'e'	63.8 z'g'-j'	69.0 z'm'-r'	78.3 z'c'-g'	79.8 z'e'-s'	1.0 a	2.3 ab
2 EcoGuard L.....	20.0 fl oz									
/SeedBoost L.....	1.0 fl oz	AI ⁵	11.5 n-w	21.5 w-z'b'	61.0 z'f'-i'	64.3 z'j'-o'	77.3 z'c'-f'	75.0 z'-l'	1.0 a	3.3 b-f
3 EcoGuard L.....	20.0 fl oz									
/TurfVigor L 9-3-6.....	15.0 fl oz									
+ KCS L 0-0-14.....	3.0 fl oz	AI ⁵	10.3 k-v	23.0 y-z'b'	65.2 z'g'-k'	67.3 z'k'-q'	82.5 z'd'-j'	73.0 z'-j'	1.0 a	2.5 a-c
4 EcoGuard L.....	20.0 fl oz									
/Daconil Ultrex 82.5 WDG.....	3.25 oz	AI ⁵	0.3 ab	0.5 ab	10.0 a-l	23.8 j-p	62.0 y-z'a'	44.0 h-m	1.0 a	5.0 i-m
5 Daconil Ultrex 82.5 WDG.....	3.25 oz	14	0.0 a	1.5 a-e	2.0 a-c	5.8 a-d	8.8 a-e	12.0 a-d	1.0 a	6.8 o-r
6 EcoGuard L.....	20.0 fl oz									
/Daconil Ultrex 82.5 WDG.....	3.25 oz	AI ⁶	2.5 a-g	7.8 c-p	12.8 d-n	32.3 p-v	52.5 s-y	33.0 g-i	1.0 a	4.8 h-l
7 RU 2125-06F.....	1.0 fl oz	21	2.5 a-g	2.0 a-f	16.0 j-p	24.5 j-p	48.5 q-w	26.0 fg	1.0 a	5.5 k-n
8 RU 2125-06F.....	1.5 fl oz	21	2.3 a-g	2.3 a-f	7.5 a-j	12.8 c-i	28.3 h-m	24.5 e-g	1.0 a	5.5 k-n
9 RU 2125-06F.....	2.0 fl oz	21	0.3 ab	0.0 a	2.3 a-c	2.3 ab	13.3 a-f	10.0 a-c	1.0 a	7.3 q-t
10 RU 2125-06F.....	1.5 fl oz									
+ RU 2125-06L.....	4.0 oz	21	0.0 a	0.3 a	1.0 ab	0.5 a	10.0 a-f	8.8 a-c	1.0 a	8.3 tu
11 RU 2125-06E.....	1.5 fl oz	21	0.8 a-c	0.5 ab	4.5 a-g	10.3 a-h	36.8 l-p	11.0 a-c	1.3 b	7.3 q-t
12 Chipco Ailette Signature 80WG.....	4.0 oz									
+ Daconil Ultrex 82.5 WDG..	3.25 oz	14	0.0 a	1.5 a-e	0.0 a	3.3 a-c	3.0 ab	4.5 ab	1.0 a	7.8 r-u
13 Chipco Ailette Signature 80WG.....	4.0 oz	14	2.5 a-g	3.8 a-j	3.8 a-f	26.0 k-q	60.0 x-y	52.5 m-s	1.0 a	4.5 g-k
14 Chipco Ailette Signature 80WG.....	4.0 oz	21	2.5 a-g	7.8 c-p	19.0 k-r	31.3 p-u	74.0 z'c'-d'	46.5 k-p	1.0 a	4.5 g-k
Plant Food Program #1.....	— ⁷	14	1.3 a-d	4.0 a-k	11.0 b-l	25.0 j-p	27.0 h-l	35.5 g-k	1.0 a	5.5 k-n
Plant Food Program #2.....	— ⁸	14	10.0 k-u	22.5 x-z'b'	50.8 z'b'-e'	55.8 z'e'-j'	85.5 z'e'-k'	67.5 w-z'e'	1.0 a	3.5 c-g
RU192514A-06.....	0.0057 oz	14	15.8 u-y	21.8 w-z'b'	56.3 z'd'-g'	65.8 z'k'-p'	90.0 z'i'-k'	92.3 z't'-v'	1.3 b	2.3 ab
RU192514A-06.....	0.0115 oz	14	9.0 h-s	17.8 u-z	37.3 v-y	50.3 z'a'-h'	87.3 z'f'-k'	84.8 z'j'-u'	1.0 a	3.0 a-e
RU192514A-06.....	0.0172 oz	14	4.0 a-j	7.3 b-p	22.3 n-t	32.5 p-v	78.0 z'c'-g'	75.5 z'a'-m'	1.0 a	3.0 a-e

(Continued)

Table 1 (continued).

Treatment	Rate per 1000 sq ft)	Spray Interval (days) ⁴	Turf Area Infested (%) per Plot ¹					Phyto-toxicity ²	Turf Quality ³	
			28 June	8 July	18 July	27 July	7 Aug.			17 Aug.
20 RU192514B-06	3.2 oz	14	0.0 a	1.3 a-d	3.5 a-e	9.3 a-g	13.8 b-f	14.5 b-f	1.0 a	6.8 o-r
21 RU192514C-06	1.0 fl oz	14	1.8 a-f	10.5 j-s	39.3 w-z	52.0 z'b'-h'	80.5 z'c'-i'	77.3 z'b'-o'	1.0 a	3.5 c-g
22 RU192514A-06	0.0057 oz	14	1.3 a-d	2.8 a-h	1.0 ab	6.3 a-e	7.3 a-d	12.3 a-e	1.0 a	7.3 q-t
23 + RU192514B-06	3.2 oz	14	0.5 ab	4.8 a-m	2.3 a-c	8.0 a-f	18.5 e-i	19.0 c-f	1.0 a	5.3 j-n
24 + RU192514A-06	0.0115 oz	14	0.0 a	3.8 a-j	0.5 a	7.8 a-f	9.5 a-f	18.8 c-f	1.0 a	5.8 l-o
25 + RU192514B-06	3.2 oz	14	5.3 a-m	5.5 a-n	24.5 o-u	41.5 v-z'a'	74.0 z'c'-d'	85.0 z'j'-u'	1.0 a	3.0 a-e
26 + RU192514C-06	1.0 fl oz	14	3.5 a-i	4.5 a-m	21.3 m-s	39.5 u-z	71.8 z-z'd'	67.0 v-z'd'	1.0 a	3.8 d-h
27 + RU192514A-06	0.0172 oz	14	0.8 a-c	4.0 a-k	12.8 d-n	24.3 j-p	57.0 t-y	46.3 j-p	1.0 a	4.3 f-j
28 + RU192514C-06	1.0 fl oz	14	6.5 c-o	23.3 y-z'b'	56.8 z'd'-g'	71.5 z'n'-s'	90.8 z'i'-k'	89.3 z'o'-v'	1.0 a	2.3 ab
29 Heritage TL 0.8ME	1.0 fl oz	14	4.5 a-k	5.3 a-n	10.0 a-l	21.0 i-o	48.3 q-v	67.8 w-z'e'	1.0 a	4.0 e-i
30 Dacnil Weather Stik 6F	2.0 fl oz	14	1.8 a-f	6.0 a-n	7.0 a-j	16.0 e-j	30.8 j-n	45.3 i-o	1.0 a	4.8 h-l
31 Dacnil Weather Stik 6F	3.6 fl oz	14	0.3 ab	3.0 a-h	13.5 e-n	26.8 l-r	54.3 s-y	63.0 r-z'	1.0 a	3.8 d-n
32 Heritage TL 0.8ME	1.0 fl oz	14	0.0 a	3.0 a-h	3.0 a-c	9.0 a-g	20.0 f-j	35.0 g-k	1.0 a	5.0 i-m
33 + Dacnil Weather Stik 6F	3.6 fl oz	14	2.0 a-g	13.3 o-v	13.8 g-n	24.8 j-p	38.8 m-q	44.5 i-n	1.0 a	4.5 g-k
34 EXC 990 SC	4.0 fl oz	14	1.0 a-d	5.0 a-m	18.0 k-q	32.5 p-v	62.8 y-z'b'	78.3 z'c'-q'	1.0 a	3.3 b-f
35 EXC 991 SC	2.75 fl oz	14	0.8 a-c	1.5 a-e	6.5 a-j	16.5 f-k	31.3 k-n	34.0 g-j	1.0 a	5.0 i-m
36 Concert 4.3SE	3.0 fl oz	14	1.5 a-e	4.5 a-m	1.5 a-c	11.3 b-i	16.0 c-g	15.8 b-f	1.0 a	6.3 n-q
37 Concert 4.3SE	5.4 fl oz	14	1.8 a-f	8.3 e-q	14.5 g-o	33.5 p-v	44.0 o-s	72.5 z'-i'	1.0 a	3.0 a-e
38 Emerald Isle Program #1	— ⁹	14	0.0 a	1.0 a-c	3.0 a-c	16.8 f-k	28.5 i-m	56.0 m-w	1.0 a	4.3 f-j
39 Emerald Isle Program #2	— ¹⁰	14	0.3 ab	1.0 a-c	1.5 a-c	18.5 g-l	29.3 i-m	48.0 l-q	1.0 a	4.5 g-k
40 Emerald Isle Program #3	— ¹¹	14	1.3 a-d	11.0 l-u	15.0 h-p	30.8 o-u	50.0 r-x	59.3 q-y	1.0 a	4.3 f-j
41 Dacnil Ultrex 82.5WDG	1.8 oz	14	30.0 z'b'-c'	42.8 z'j'	77.5 z'i'	81.5 z't'-u'	91.3 z'i'-k'	97.8 z'v'	1.0 a	2.0 a
Insignia 20WG	0.9 oz	14								

(Continued)

Table 1 (continued).

Treatment	Rate per 1000 sq ft	Spray Interval (days) ⁴	Turf Area Infested (%) per Plot ¹					Phyto-toxicity ² 9 June	Turf Quality ³ 17 Aug.
			28 June	8 July	18 July	27 July	7 Aug.		
42 Insignia 20WG	0.9 oz								
+ Manicure 82.5WG	3.2 oz	14	0.3 ab	4.8 a-m	6.0 a-j	19.5 h-m	57.8 u-y	56.8 n-x	3.3 b-f
43 Insignia 20WG	0.9 oz								
+ Propiconazole Pro 1.3MC	1.0 fl oz	14	3.8 a-j	10.3 i-r	24.8 p-u	46.5 y-z'e'	75.0 z'c'-e'	69.0 x-z'f'	3.5 c-g
44 Insignia 20WG	0.9 oz								
+ Alude 46L	5.0 fl oz	14	2.0 a-g	5.0 a-m	14.3 g-n	36.0 r-x	71.5 z-z'c'	76.5 z'b'-n'	3.8 d-h
45 Insignia 20WG	0.9 oz								
+ Revolution L	6.0 fl oz	14 ¹²	3.5 a-i	5.8 a-n	37.0 v-y	53.5 z'c'-i'	87.0 z'f'-k'	88.3 z'n'-v'	2.3 ab
46 Insignia 20WG	0.9 oz								
+ Cascade L	8.0 fl oz	14 ¹³	9.3 i-s	18.0 v-z	42.0 x-z'b'	62.5 z'i'-n'	77.5 z'c'-f'	91.8 z's'-v'	2.5 a-c
47 Insignia 20WG	0.9 oz								
+ RU20189A-06	4.0 fl oz	14 ¹⁴	2.0 a-g	9.3 g'r	36.3 v-y	59.5 z'h'-m'	86.3 z'f'-k'	85.0 z'j'-u'	2.3 ab
48 Disarm 480SC	0.18 fl oz	14	24.5 z'a'-b'	41.3 z'j'	72.5 z'j'-l'	81.3 z's'-u'	92.3 z'j'-k'	89.8 z'p'-v'	2.3 ab
49 Disarm 480SC	0.36 fl oz	14	15.8 u-y	36.0 z'i'-j'	66.0 z'g'-k'	76.5 z'q'-u'	90.3 z'i'-k'	86.3 z'l'-v'	2.5 a-c
50 Disarm 480SC	0.18 fl oz								
+ Banner MAXX 1.3ME	1.0 fl oz	14	2.8 a-g	8.3 e-q	39.5 w-z	48.5 z-z'g'	73.8 z'c'-d'	70.5 y-z'g'	3.0 a-e
51 Disarm 480SC	0.18 fl oz								
+ Daconil Ultrex 82.5WDG	1.8 oz	14	2.5 a-g	4.3 a-l	14.3 g-n	24.3 j-p	38.3 m-q	60.0 q-z	4.0 e-i
52 Disarm 480SC	0.18 fl oz								
+ Endorse 2.5W	2.0 oz	14	0.3 ab	3.3 a-h	11.5 c-m	33.5 p-v	72.8 z'a'-d'	68.0 w-z'f'	4.0 e-i
53 Disarm 480SC	0.18 fl oz								
+ Banner MAXX 1.3ME	1.0 fl oz	14	15.8 u-y	17.3 s-y	22.8 n-t	39.0 t-z	56.3 t-y	54.5 m-u	4.8 h-l
+ TM-90109	4.0 fl oz	Alt ¹⁵	17.5 x-z	23.3 y-z'b'	65.3 z'g'-k'	74.0 z'o'-t'	90.5 z'i'-k'	91.0 z'l'-v'	2.3 ab
54 Disarm 480SC	0.18 fl oz								
+ Banner MAXX 1.3ME	1.0 fl oz	Alt ¹⁵	7.5 f-g	12.0 n-v	48.3 z-z'd'	62.5 z'i'-n'	73.0 z'b'-d'	77.8 z'c'-p'	3.5 c-g
55 Disarm 480SC	0.18 fl oz								
+ Endorse 2.5W	2.0 oz	14	10.5 l-w	22.5 x-z'b'	42.5 x-z'b'	67.8 z'l'-r'	80.5 z'c'-i'	83.0 z'h'-u'	2.8 a-d
56 Banner MAXX 1.3ME	1.0 fl oz	14	6.0 b-n	8.5 f-q	22.8 n-t	35.0 q-w	57.0 t-y	58.3 p-y	4.8 h-l
57 Endorse 2.5W	2.0 oz	14	2.5 a-g	3.8 a-j	14.8 h-p	31.5 p-u	45.3 o-s	40.0 h-l	5.5 k-n
58 Endorse 2.5W	4.0 oz	14	10.5 l-w	21.0 w-z'a'	45.8 y-z'c'	58.0 z'g'-l'	87.5 z'f'-k'	87.0 z'l'-v'	3.0 a-e
59 3336 Plus 19.4F	6.0 fl oz	14							

(Continued)

Table 1 (continued).

Treatment	Rate per 1000 sq ft)	Spray Interval (days) ⁴	Turf Area Infested (%) per Plot ¹					Phyto-toxicity ²	Turf Quality ³	
			28 June	8 July	18 July	27 July	7 Aug.			17 Aug.
60 3336 Plus 19.4F	6.0 fl oz	14	1.0 a-d	3.5 a-i	5.3 a-h	19.8 h-m	41.0 n-r	38.8 h-l	1.0 a	5.5 k-n
+ Alude 46L	5.5 fl oz									
61 3336 Plus 19.4F	6.0 fl oz	14	1.8 a-f	6.8 a-o	9.3 a-k	24.3 j-p	48.5 q-w	40.0 h-l	1.0 a	5.3 j-n
+ CL-EXP-11 L	5.5 fl oz									
62 Alude 46L	5.5 fl oz	14	3.5 a-i	4.5 a-m	14.0 g-n	29.8 n-u	52.5 s-y	51.0 l-r	1.0 a	4.3 f-j
63 CL-EXP-11 L	5.5 fl oz	14	16.3 w-y	16.0 r-x	28.3 r-v	51.0 z'a'-h'	59.3 w-y	57.3 o-x	1.0 a	4.8 h-l
64 CL-EXP-4 W	1.0 oz	14	13.5 r-x	26.0 z'a'-g'	68.3 z'h'-l'	71.5 z'n'-s'	88.0 z'f'-k'	84.0 z'h'-u'	1.0 a	2.8 a-d
65 CL-EXP-4 W	2.0 oz	14	12.0 o-x	17.5 t-y	42.3 x-z'b'	50.3 z'a'-h'	75.0 z'c'-e'	71.8 z-z'h'	1.0 a	3.8 d-h
66 CL-EXP-9	0.6 oz	14	7.5 f-q	6.3 a-n	15.5 i-p	32.0 p-v	41.0 n-r	32.0 gh	1.0 a	5.5 k-n
67 CL-EXP-9	1.2 oz	14	2.5 a-g	1.5 a-e	2.3 a-c	10.5 b-h	9.5 a-f	6.8 a-c	1.3 b	7.3 q-t
68 Rhapsody AS	5.0 fl oz	14	13.5 r-x	36.0 z'i'-j'	68.8 z'h'-l'	72.8 z'o'-t'	94.5 z'k'	90.5 z'q'-v'	1.3 b	2.3 ab
69 Rhapsody AS	5.0 fl oz	14	0.5 ab	4.0 a-k	11.5 c-m	13.5 d-i	31.3 k-n	33.8 g-i	1.0 a	5.3 j-n
+ Daconil Ultrex 82.5WDG	2.75 oz									
70 Daconil Ultrex 82.5WDG	2.75 oz	14	1.0 a-d	5.8 a-n	9.8 a-l	20.5 i-n	46.5 p-t	53.8 m-t	1.0 a	5.0 i-m
71 Medallion 50W	0.25 oz	14	4.8 a-l	10.8 k-t	31.5 t-w	53.5 z'c'-l'	90.0 z'i'-k'	87.0 z'l'-v'	1.0 a	2.5 a-c
72 Medallion 50W	0.33 oz	14	3.8 a-j	8.0 d-p	19.8 l-r	37.0 s-y	80.8 z'c'-l'	75.3 z'l'	1.0 a	4.0 e-i
73 SARS-346 40WP ¹⁶	0.3 oz	14	12.3 o-x	16.0 r-x	33.8 u-x	43.5 w-z'b'	50.0 r-x	63.8 s-z'a'	1.0 a	4.3 f-j
74 SARS-346 40WP ¹⁶	0.4 oz	14	6.8 d-o	14.0 p-v	28.5 r-v	45.3 x-z'd'	59.8 xy	65.3 t-z'b'	1.0 a	4.3 f-j
75 SARS-346 40WP ¹⁷	0.4 oz	21	7.8 g-r	10.8 l-t	30.0 s-w	31.5 p-u	77.3 z'c'-f'	67.3 v-z'd'	1.0 a	4.0 e-i
76 SARS-346 40WP ¹⁶	0.6 oz	14	2.0 a-g	9.5 h-r	24.8 p-u	32.5 p-v	61.5 yz	53.5 m-t	1.0 a	4.8 h-l
77 SARS-346 40WP ¹⁷	0.6 oz	21	9.5 j-t	15.0 q-w	49.8 z'a'-d'	55.0 z'd'-j'	88.8 z'g'-k'	78.8 z'd'-r'	1.0 a	3.0 a-e
78 SARS-346 40WP ¹⁸	0.6 oz	28	15.3 t-y	28.3 z'b'-h'	50.8 z'b'-e'	48.0 z-z'f'	78.8 z'c'-h'	73.3 z'-k'	1.3 b	3.5 c-g
79 SARS-346 40WP ¹⁷	0.4 oz	21	12.8 p-x	11.3 m-v	43.0 x-z'b'	50.0 z'a'-h'	81.3 z'c'-l'	78.0 z'c'-p'	1.0 a	3.5 c-g
+ Cleary 3336 4F	2.0 fl oz									
80 SARS-346 40WP ¹⁸	0.4 oz	28	9.5 j-t	25.5 z'a'-f'	39.8 w-z'a'	55.0 z'd'-j'	71.8 z-z'd'	66.3 u-z'c'	1.0 a	3.8 d-h
+ Cleary 3336 4F	2.0 fl oz									
81 Heritage 50WDG	0.2 oz	14	11.0 m-w	42.5 z'j'	60.0 z'e'-h'	69.5 z'n'-r'	88.0 z'f'-k'	84.5 z'i'-u'	1.0 a	2.5 a-c
82 Heritage 50WDG	0.4 oz	28	19.5 y-z'a'	36.5 z'j'	74.0 z'k'-l'	75.0 z'p'-u'	90.8 z'i'-k'	87.8 z'm'-v'	1.0 a	2.5 a-c
83 Spectator Ultra 1.3EC	1.0 fl oz	14	9.0 h-s	8.0 d-p	35.5 v-x	54.0 z'd'-l'	81.0 z'c'-l'	80.3 z'f'-t'	1.0 a	3.0 a-e
84 Spectator Ultra 1.3EC	2.0 fl oz	28	7.3 e-p	24.0 y-z'd'	38.8 w-z	57.5 z'f'-k'	89.5 z'h'-k'	85.5 z'k'-v'	2.0 c	3.3 b-f
85 Manicure Ultra 82.5WDG	3.25 oz	7	0.3 ab	2.0 a-f	1.0 ab	4.8 a-d	5.3 a-c	1.5 a	1.0 a	8.5 u

(Continued)

Table 1 (continued).

Treatment	Rate per 1000 sq ft)	Spray Interval (days) ⁴	Turf Area Infested (%) per Plot ¹					Phyto-toxicity ² 9 June	Turf Quality ³ 17 Aug.	
			28 June	8 July	18 July	27 July	7 Aug.			17 Aug.
86 Manicure Ultra 82.5WDG	5.0 oz	14	1.0 a-d	4.3 a-l	5.8 a-i	9.5 a-g	35.3 k-o	25.0 fg	1.0 a	5.8 l-o
87 Manicure 6F	5.5 fl oz	14	0.3 ab	6.3 a-n	3.8 a-f	7.5 a-f	25.5 g-k	24.3 d-g	1.0 a	6.0 m-p
88 Spectator Ultra 1.3EC	2.0 fl oz	21	3.8 a-j	11.3 m-v	9.8 a-l	23.8 j-p	47.0 p-u	50.0 l-q	1.0 a	4.5 g-k
89 Manicure Ultra 82.5WDG	5.0 oz	14	0.0 a	1.5 a-e	0.3 a	3.5 a-c	6.5 a-c	13.8 a-f	1.0 a	7.0 p-s
+ Spectator Ultra 1.3EC	1.0 fl oz	14	17.5 x-z	23.5 y-z'c'	53.5 z'c'-f'	77.3 z'r'-u'	93.5 z'k'	91.3 z's'-v'	1.0 a	2.5 a-c
90 Urea 46-0-0	0.13 lb N	14	1.0 a-d	6.0 a-n	27.5 q-v	43.8 w-z'c'	81.3 z'c'-i'	82.5 z'g'-u'	1.0 a	3.0 a-e
91 Chipco 26GT 2SC	4.0 fl oz	14	13.3 q-x	30.8 z'd'-i'	71.3 z'j'-l'	80.3 z's'-u'	94.3 z'k'	88.3 z'n'-v'	1.0 a	2.3 ab
92 Curalan 50EG	1.0 oz	14	22.3 z-z'a'	31.8 z'f'-i'	67.0 z'h'-k'	75.8 z'q'-u'	93.8 z'k'	90.5 z'q'-v'	1.3 b	2.5 a-c
93 Prostar 70W	2.2 oz	14	5.5 a-m	5.0 a-m	24.8 p-u	30.8 o-u	29.3 i-m	24.5 e-g	1.0 a	6.0 m-p
94 Rutgers Program #1	—	Var ¹⁹	1.0 a-d	4.3 a-l	11.5 c-m	25.8 j-q	48.8 q-w	53.3 m-t	1.0 a	4.0 e-i
95 RU21196A-06	0.53 fl oz	14	0.0 a	2.3 a-f	3.3 a-d	9.0 a-g	17.5 d-h	15.0 b-f	1.0 a	6.0 m-p
96 RU21196A-06	0.88 oz	14	1.3 a-d	2.5 a-g	14.5 g-o	28.8 m-s	59.0 v-y	55.0 m-v	1.0 a	4.0 e-i
97 RU21196A-06	0.44 fl oz	14	0.5 ab	4.0 a-k	14.0 g-n	29.3 m-t	50.3 r-x	50.3 l-q	1.0 a	4.8 h-l
+ RU21196B-06	0.46 oz	14	0.0 a	1.3 a-d	1.5 a-c	7.3 a-f	17.5 d-h	14.0 b-f	1.0 a	6.8 o-r
98 RU21196A-06	0.66 fl oz	14	14.3 s-y	30.3 z'c'-i'	70.3 z'i'-l'	84.0 z'u'	95.5 z'k'	89.5 z'o'-v'	1.0 a	2.0 a
+ RU21196B-06	0.92 oz	14	11.0 m-w	33.5 z'h'-l'	69.5 z'h'-l'	67.3 z'k'-q'	92.3 z'j'-k'	94.3 z'u'v'	1.0 a	2.3 ab
99 RU21196A-06	0.83 oz	14	16.0 v-y	32.5 z'g'-l'	74.5 z'k'-l'	80.8 z's'-u'	95.3 z'k'	92.8 z'u'v'	1.0 a	2.0 a
+ RU21196B-06	1.1 oz	14	3.3 a-h	6.8 a-o	1.3 ab	13.5 d-i	5.3 a-c	4.0 ab	1.0 a	8.5 u
100 Chipco Signature 80WG	4.0 oz	14	1.0 a-d	2.3 a-f	0.0 a	4.5 a-d	2.8 a	4.0 ab	1.0 a	8.8 u
+ Daconil Ultrex 82.5WDG	3.5 oz	14	1.8 a-f	5.8 a-n	0.8 a	8.5 a-f	2.5 a	6.0 ab	1.0 a	8.0 s-u
101 PEX – 6012 80WG	4.0 oz	14	32.3 z'c'	31.0 z'e'-l'	70.3 z'i'-l'	74.8 z'p'-u'	92.5 z'j'-k'	89.3 z'o'-v'	1.0 a	2.8 a-d
+ Pegasus 82.5DF	3.5 oz	—	34.8 z'c'	32.0 z'f'-i'	71.5 z'j'-l'	84.5 z'u'	95.3 z'k'	97.8 z'v'	1.0 a	2.0 a
102 Untreated Check	—	—	—	—	—	—	—	—	—	—
103 Untreated Check	—	—	—	—	—	—	—	—	—	—

(Continued)

Table 1 (continued).

Treatment	Rate per 1000 sq ft	Spray Interval (days) ⁴	Turf Area Infested (%) per Plot ¹						Phyto-toxicity ²	Turf Quality ³
			28 June	8 July	18 July	27 July	7 Aug.	17 Aug.		
			INT ²⁰	DAT ²¹	DAT	DAT	DAT	DAT	DAT	DAT
			7	7	3	6	8	5	1	2
			14	14	10	6	15	11	8	9
			21	21	10	20	8	17	8	2
			28	14	24	6	15	24	8	23

¹ Values are means of four replicates. Means followed by the same letter are not significantly different according to Waller-Duncan k-ratio t-test ($k=100$).

² Phytotoxicity on a 1 to 5 scale where 1 = no discoloration, 2 = slight foliar chlorosis or necrosis, 3 = moderate chlorosis or necrosis, 4 = severe chlorosis or necrosis, and 5 = all turf dead.

³ Turf quality on a 1 to 9 scale, where 9 = best turf quality and 6 = commercially acceptable quality.

⁴ Fungicides were applied on 17 May (all treatments, except treatments 33, 34, 61, 63, 68, 69, 103, 104, and 105), 24 May (7-day treatment, treatments 68 and 69 initiated), 31 May (7- and 14-day treatments, treatments 33 and 34 initiated), 7 June (7- and 21-day treatments), 14 June (7, 14-, and 28-day treatments, treatments 61, 63, and 103 to 105 initiated), 21 June (7-day treatment), 28 June (7-, 14-, and 21-day treatments), 5 July (7-day treatment), 12 July (7-, 14-, and 28-day treatments), 19 July (7- and 21-day treatments), 27 July (7- and 14-day treatments), 2 August (7-day treatment), 9 August (7-, 14-, 21-, and 28-day treatments), and 16 August (7- day treatment). Entire test area was treated with Daconil Ultrex 82.5WDG (5.0 oz/1,000 sq ft) on 21 August to arrest the infection and to allow for renovation of the test area.

⁵ Alternation of fungicides on a 7-day schedule, where treatments 2 to 4 received EcoGuard L (20.0 fl oz) on 17 and 31 May, 14 and 28 June, 12 and 26 July, and 9 and 23 August, and either Seed Boost L (1.0 fl oz, treatment 2), Turf Vigor L 9-3-6 (15.0 fl oz) + KCS L 0-0-14 (3.0 fl oz, treatment 3), or Daconil Ultrex 82.5WDG (3.25 oz, treatment 4), on 24 May, 7 and 21 June, 5 and 19 July, and 2, 16, and 30 August.

⁶ Alternation of fungicides on a 14-day schedule, where treatment 6 received EcoGuard L (20.0 fl oz) on 17 May, 14 June, 12 July, and 9 August, and Daconil Ultrex 82.5WDG (3.25 oz) on 31 May, 28 June, 26 July, and 23 August.

⁷ Treatment 15 (Pant Food Program #1) consisted of Foliar Phosphate 0-29-26 (3.0 fl oz) + Green T 12-3-12 50% SRN (6.0 fl oz) + Green T N-28-SRN 28-0-0 72% SRN (6.0 fl oz) + Sugar Cal 10% Ca (2.0 fl oz) + Daconil Ultrex 82.5WDG (1.8 oz) + Primo MAXX 1MC (0.125 fl oz).

⁸ Treatment 16 (Pant Food Program #2) consisted of Foliar Phosphate 0-29-26 (3.0 fl oz) + Green T 12-3-12 50% SRN (6.0 fl oz) + Green T N-28-SRN 28-0-0 72% SRN (6.0 fl oz) + Sugar Cal 10% Ca (2.0 fl oz) + EcoGuard L (10.0 fl oz) + Primo MAXX 1MC (0.125 fl oz).

⁹ Treatment 37 (Emerald Isle Program #1) consisted of CPR 4-0-1 (6.0 fl oz) + True Foliar P 6-12-6 (3.0 fl oz) + True Foliar NPK 10-3-16 (3.75 fl oz) + True Foliar N-Ca 15-0-0 (3.0 fl oz) + True Foliar Si 3-0-10 (3.0 fl oz) + True Foliar MgMn 6-0-0 (3.0 fl oz) + Daconil Ultrex 82.5WDG (1.8 oz).

¹⁰ Treatment 38 (Emerald Isle Program #2) consisted of CPR 4-0-1 (6.0 fl oz) + True Foliar NPK 10-3-16 (7.5 fl oz) + True Foliar NK 10-0-10 (6.0 fl oz) + True Foliar Si 3-0-10 (3.0 fl oz) + Daconil Ultrex 82.5WDG (1.8 oz).

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Table 1 (continued).

- ¹¹ Trt 39 (Emerald Isle Program #3) consisted of CPR 4-0-1 (3.0 fl oz) + True Foliar N 19-1-6 (6.0 fl oz) + True Foliar NPK 10-3-16 (9.0 fl oz) + Daconil Ultrex 82.5WDG (1.8 oz).
- ¹² For treatment 45, Revolution L (6.0 fl oz) was sprayed first and immediately irrigated with 0.5 gal water/plot. Once foliage dried, Insignia 20WG (0.9 oz) was applied in 2 gal water/1000 sq ft.
- ¹³ For treatment 46, Cascade L (8.0 fl oz) was sprayed first and immediately irrigated with 0.5 gal water per plot. Once foliage dried, Insignia 20WG (0.9 oz) was applied in 2 gal water/1000 sq ft.
- ¹⁴ For treatment 47, RU20189A-06 (4.0 fl oz) was sprayed first and immediately irrigated with 0.5 gal water per plot. Once foliage dried, Insignia 20WG (0.9 oz) was applied in 2 gal water/1000 sq ft.
- ¹⁵ Alternation of fungicides on a 14-day schedule, where treatments 54 and 55 received Disarm 480SC (0.18 fl oz) on 17 May, 14 June, 12 July, and 9 August, and either Banner MAXX 1.3ME (1.0 fl oz, treatment 54) or Endorse 2.5W (2.0 oz, treatment 55) on 31 May, 28 June, 26 July, and 23 August.
- ¹⁶ Treatments 73, 74, and 76 received SARS-346 30EW on 17 and 31 May at 0.35, 0.5, and 0.75 fl oz/1000 ft², respectively, and then SARS-346 40WP at the rates indicated in this table every 14 days from 14 June to 23 August.
- ¹⁷ Treatments 75, 77, and 79 received SARS-346 30EW on 17 May and 7 June at 0.5, 0.75, and 0.5 fl oz/1000 ft², respectively, and then SARS-346 40WP at the rates indicated in this table every 21 days from 28 June to 30 August.
- ¹⁸ Treatments 78 and 80 received SARS-346 30EW on 17 May at 0.75 and 0.5 fl oz/1000 ft², respectively, and then SARS-346 40WP at the rates indicated in this table on 14 June, 12 July, and 9 August.
- ¹⁹ Variable spray schedule, where treatment 94 (Rutgers Program #1) consisted of Banner MAXX 1.3MC (1.0 fl oz) on 17 May, Daconil Ultrex 82.5WDG (3.2 oz) on 31 May, Heritage TL 0.8ME (1.0 fl oz) on 14 June, Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (2.75 oz) on 28 June, Endorse 2.5W (3.0 oz) + Daconil Ultrex 82.5WDG (2.75 oz) on 12 July, Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (2.4 oz) on 26 July, 3336 Plus 19.4F (6.0 fl oz) + Daconil Ultrex 82.5WDG (2.4 oz) on 9 August, and Chipco Signature 80WG (4.0 oz) + Daconil Ultrex 82.5WDG (2.4 oz) on 23 August.
- ²⁰ Spray intervals in days.
- ²¹ Days after treatment (DAT) for each spray interval.



Cooperating Agencies: Rutgers, The State University of New Jersey, U.S. Department of Agriculture, and County Boards of Chosen Freeholders. Rutgers Cooperative Extension, a unit of the Rutgers New Jersey Agricultural Experiment Station, is an equal opportunity program provider and employer.